

WHAT IS CLAIMED:

1. A reordering device comprising:
 - a reorder buffer configured to store information relating to data items, each of the data items being associated a sequence number chosen from a sequence number space, the sequence number indicating a relative order of the data items;
 - a reorder buffer pointer configured to store a value indicating a rearmost active entry of the reorder buffer relative to the sequence number space; and
 - a reorder engine configured to receive the data items, the reorder engine classifying each of the received data items based on the sequence number of the data item and the value of the reorder buffer pointer, the reorder engine determining whether to store the information relating to the received data items in the reorder buffer based on the classification.
2. The reordering device of claim 1, further comprising:
 - an interface configured to receive the data items from a network and to transmit information identifying the data items to the reorder engine.
3. The reordering device of claim 2, further comprising:
 - an external memory configured to receive the data items from the interface and to store the data items.
4. The reordering device of claim 3, wherein the reorder buffer includes, for each entry in the reorder buffer:

a first storage portion for storing an address of the data item stored in the external memory, and

a second storage portion for storing information indicating whether the address stored in the first portion is valid.

5. The reordering device of claim 4, wherein the reorder buffer additionally includes, for each entry in the reorder buffer:

a third storage portion for storing information indicating a type of the data item.

6. The reordering device of claim 1, wherein the classifying utilizes a plurality of regions including:

a first region corresponding to the sequence number of the data item falling within a sequence number range covered by the reorder buffer, and

a second region corresponding to the sequence number of the data item falling within a sequence number range extending from a head of the reorder buffer to a predetermined range beyond the head of the reorder buffer.

7. The reordering device of claim 6, wherein the plurality of regions further includes:

a third region corresponding to the sequence number of the data item falling within a sequence number range outside of the first and second regions.

8. The reordering device of claim 6, wherein when the reorder engine classifies the data item as belonging to the second region, the reorder engine shifts the value in the reorder buffer pointer to create a shifted version of the reorder buffer, and invalidates the data items that are no longer in the shifted version of the reorder buffer.

9. The reordering device of claim 6, wherein when the reorder engine classifies the data item as belonging to the first region, the reorder engine stores the information relating to the data item in the reorder buffer.

10. The reordering device of claim 7, wherein when the reorder engine classifies the data item as belonging to the third region, the reorder engine drops the data item.

11. The reordering device of claim 3, wherein the reorder buffer includes, for each entry in the reorder buffer:

a flush bit that stores information indicating whether the external memory contains memory allocated to a previously invalidated entry in the reorder buffer.

12. A method of ordering data items comprising:
receiving the data items, the received data items being associated with a sequence number chosen from a sequence number space, the sequence number indicating a relative order of the data items;

classifying the received data items as one of a plurality of possible classifications based on the sequence number of the data items and a value that defines a position of a reorder buffer in the sequence number space; and processing the data items based on the classifications.

13. The method of claim 12, wherein classifying the data items further includes:

classifying the data items as belonging to a first region when the sequence number of the data items fall within a sequence number range encompassed by the reorder buffer, and

classifying the data items as belonging to a second region when the sequence number of the data item falls within a sequence number range extending from a head of the reorder buffer to a predetermined range beyond the head of the reorder buffer.

14. The method of claim 13, wherein classifying the data items further includes:

classifying the data items as belonging to a third region when the sequence number of the data items falls within a sequence number range outside of the first and second regions.

15. The method of claim 13, wherein processing the data items includes, when the data items are classified as belonging to the second region:

shifting the sequence number range encompassed by the reorder buffer to create a shifted version of the reorder buffer, and

invalidating the data items that are no longer in the shifted version of the reorder buffer.

16. The method of claim 13, wherein processing the data items includes, when the data items are classified as belonging to the first region: entering information relating to the data items in the reorder buffer.

17. The method of claim 14, wherein processing the data items includes, when the data items are classified as belonging to the third region: dropping the data item.

18. A network device comprising:
a data transmission component; and
a plurality of processing elements connected by the data transmission component, the processing elements communicating with one another by transmitting data items over the data transmission component, the processing elements each including a reorder component configured to arrange received data items into an order corresponding to an order in which the data items were transmitted, each of the reorder components including:

a reorder buffer configured to store the data items, each of the data items including a sequence number chosen from a sequence number space, the sequence number indicating the order of the data items, and

a reorder engine configured to classify the data items based on the sequence number of the data items and based on a position of the reorder buffer relative to the sequence number space, the reorder engine determining whether to store the data items in the reorder buffer based on the classification of the data items.

19. The network device of claim 18, further comprising:

a reorder buffer pointer that stores a value indicating the position of the reorder buffer relative to the sequence number space.

20. The network device of claim 18, wherein the network device is a router.

21. The network device of claim 18, wherein the reorder buffer includes, for each entry in the reorder buffer:

a first storage portion for storing information indicating whether the address stored in the first portion is valid.

22. The network device of claim 18, wherein the reorder buffer additionally includes, for each entry in the reorder buffer:

a second storage portion for storing information indicating a type of the data item.

23. The network device of claim 19, wherein the classification utilizes a plurality of regions, including:

a first region corresponding to the sequence number of the data item falling within a sequence number range covered by the reorder buffer, and

a second region corresponding to the sequence number of the data item falling within a sequence number range extending from the value stored in the reorder buffer pointer to a predetermined range beyond the value stored in the reorder buffer pointer.

24. The network device of claim 23, wherein the plurality of regions further includes:

a third region corresponding to the sequence number of the data item falling within a sequence number range outside of the first and second regions.

25. The network device of claim 18, wherein the reorder buffer includes, for each entry in the reorder buffer:

a flush bit that stores information indicating whether additional processing is required to invalidate the entry in the reorder buffer.

26. A system for ordering data items, comprising:

means for receiving the data items, the received data items being associated with a sequence number chosen from a sequence number space, the sequence numbers indicating a relative order of the data items;

means for classifying the received data items into one of a plurality of possible classifications based on the sequence number of the data items in relation to a value that defines the position of a reorder buffer in the sequence number space; and

means for processing the data items in the reorder buffer based on the classifications of the data items.